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NORTHERN

Utilization Research & Development Division

Publications and Patents

July - December 1968

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**Agricultural Research Service
United States Department of Agriculture**

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Northern Utilization Research and Development Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

INTRODUCTION

The Congress in 1938 authorized four regional laboratories, now known as Utilization Research and Development Divisions, to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. The need and importance of such research arise because the farmer is not organized to carry on modern scientific research to maintain old markets for his products and to create new ones. Since their inauguration, these laboratories have contributed much basic knowledge of the chemical composition and physical properties of farm commodities and have applied this knowledge to create new or improved products and processing technology that have enhanced utilization of many farm commodities.

The Northern Utilization Research and Development Division is responsible for research on industrial utilization of the cereal grains—corn, wheat, barley,

grain sorghum, and oats; and the oilseeds—soybeans and flaxseed. Except for wheat and barley, the research includes food and feed uses of these crops. In the Department's program of research on replacement crops, the Northern Division conducts all screening and characterization studies on uncultivated plants and their components. It is also responsible for more intensive research on new oilseeds containing erucic acid and on new gum and pulp fiber plants. In addition to its internal program of research, it carries out work through domestic contracts and grants and conducts related research abroad under grants or contracts involving Public Law 480 funds.

The research investigations at the Northern Division are supported by more than 450 people, about one-half of whom have professional status. This body of highly trained men and women with specialized knowledge in various disciplines are responsible for the scientific publications and patents listed here.

REQUEST FOR INFORMATION

The results of the research of the Northern Utilization Research and Development Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 34). As a convenient guide to our publications and patents, a list with abstracts is published semi-annually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Requests for specific reprints should be by number and addressed to the Northern Division. Those titles

marked with an asterisk (*) are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U. S. Department of Agriculture, Washington, D. C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.



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PUBLICATIONS

[Publications marked with an asterisk (*) are not available for distribution. When requesting reprints, please order by number.]

- 2375** ● **Fifth National Conference on Wheat Utilization Research, held at Fargo, N. Dak., November 1-3, 1967**
NORTH. UTIL. RES. DEVELOP. DIV.
U.S. Agr. Res. Serv., ARS-71-37, 177 pp. April 1968

This report contains either the complete text or summaries of all talks that were given. The conference provided a common meeting ground where various groups interested in wheat utilization presented information to promote the wider use of wheat and

wheat products. General areas covered by one or more presentations included wheat and food for freedom, protein and food needs, wheat-based products for overseas, a technical session on wheat quality, and a look at the durum and hard red spring wheats.

- 2376** ● **Laboratory Studies on the Formation of Aflatoxin in Forages**
C. W. HESSELTINE, O. L. SHOTWELL, M. L. SMITH, G. M. SHANNON,
E. E. VANDEGRAFT, and M. L. GOULDEN
Mycologia 60(2): 304-312. March-April 1968

Forages are often subjected to mold growth both in storage and in the field and, therefore, may be contaminated with aflatoxin. Aflatoxin-producing strains of *Aspergillus flavus* were used to inoculate flasks containing moistened forages. The fungus grew well, causing considerable disintegration of the plant material. The fermented forages were extracted with chloroform for assay, and impurities were removed from extract residues by precipitation from 70% acetone solutions with lead acetate and with hexane from chloroform solutions. Partially purified extracts were

chromatographed on thin-layer plates and quantities of aflatoxin determined with a recording densitometer. All forages at 6 days showed the presence of aflatoxin, except red clover and alfalfa. All strains formed aflatoxin on timothy, sweet clover, and oat straw. Aflatoxin B₁ was produced at levels of 18 to 52 µg./g. by NRRL 3145 on sweet clover and oat straw. The highest total aflatoxin (170 µg/g.) was on oat straw fermented with NRRL 3145, as well as the highest yields of G₁, 108 µg. Results were confirmed with the duckling assay.

- 2377** ● **Homogeneous 1,4 Addition of Hydrogen Catalyzed by Tricarbonyl(arene)chromium Complexes**
E. N. FRANKEL, E. SELKE, and C. A. GLASS
J. Amer. Chem. Soc. 90(9): 2446-2448. April 1968

Deuterium tracer studies show that the reduction of methyl sorbate catalyzed by tricarbonyl(methyl benzoate) chromium proceeds by 1,4 addition. The product from deuterium reduction was identified as

methyl 2,5-dideutero-*cis*-3-hexenoate by mass spectrometry, proton and deuterium nuclear magnetic resonance, and infrared.

2378* • Organometallic Studies, XXIV. Selective Hydrogenation of Conjugated Olefins Catalyzed by Arene Chromium Tricarbonyl Complexes

MICHAEL CAIS,¹ E. N. FRANKEL, and A. REJOAN¹

(¹ Israel Institute of Technology, Haifa)

Tetrahedron Lett. (16): 1919-1923. February 1968

Arene-Cr(CO)₃ complexes catalyze selectively the hydrogenation of methyl sorbate to methyl 3-hexenoate. Conjugated fatty esters are converted to monoenes. The order of catalytic activity was modified

with changes in the substituents of the arene complexes, but the selectivity remained essentially the same.

2379 • Observations on the Infection of Japanese Beetle Larvae with *Bacillus popilliae*

HARLOW H. HALL, GRANT ST. JULIAN, and GORDON L. ADAMS

J. Econ. Entomol. 61(3): 840-843. June 1968

Adult Japanese beetles, *Popillia japonica* Newman, can be maintained en masse in captivity for egg laying. Few eggs were laid per female beetle, but 90% of the eggs hatched when incubated immediately. Between 40 and 50% of the eggs hatched after storage for 3 weeks in moist soil or in 0.85% NaCl at 3⁰ to 5⁰ C.

The larvae developed normally, were susceptible to infection with *Bacillus popilliae* Dutky, and showed symptoms typical of milky disease when infected. Spores formed in the hemolymph of diseased laboratory-reared larvae were typical of those formed in field-collected larvae.

2380 • Speed Controller for Laboratory Motor

WILLIAM K. ROHWEDDER

Rev. Sci. Instr. 38(5): 701-703. May 1967

An optical tachometer is used to control the speed of a small stirring motor. The stirring speed is controlled from 100 to 5,000 r.p.m. with an accuracy of

0.5%, and the speed can be read from a meter to that accuracy.

2381 • Publications and Patents on Fermentation Research During 1967

NORTH. UTIL. RES. DEVELOP. DIV.

U.S. Agr. Res. Serv., ARS-71-38, 7 pp. August 1968 [Processed]

2382 • Gas Flowmeter from a Leak Detector and Potentiometer

R. L. HOFFMANN and E. D. BITNER

J. Amer. Oil Chem. Soc. 45(6): 477. June 1968

A commercial gas leak detector was modified by adding a potentiometer to the meter circuit. The modified instrument may be calibrated and used for flow measurements.

This same article appeared also in the Journal of the American Oil Chemists' Society 45(8): 582. August 1968.

2383 • Improved Synthesis of 1,1,1-Trimethylolalkanes from Hexanal and Nonanal

D. J. MOORE and E. H. PRYDE

J. Amer. Oil Chem. Soc. 45(7): 517-519. July 1968

Reaction of either hexanal or nonanal with formaldehyde under conditions usual for the Tollens condensation gave the expected 1,1,1-trimethylolalkanes in 65 to 70% yields. Characterization of the crude product mixtures by silylation and subsequent gas-liquid chromatographic analysis permitted identification of byproducts. The major byproducts were the 2,2-bis(hydroxymethyl)alkanals resulting from incomplete reaction with formaldehyde; minor by-

products were the formate esters of the hydroxymethyl compounds.

These findings permitted modification of the procedure to give the 1,1,1-trimethylolalkanes in 85 to 90% yields. The modifications included (a) isolation from alkaline rather than acidic solution to prevent ester formation and (b) hydrogenation of the crude reaction products to convert the 2,2-bis(hydroxymethyl)alkanals to the 1,1,1-trimethylolalkanes.

2384 • Polyesteramides from Linseed Oil for Protective Coatings. Low Acid-Value Polymers

L. E. GAST, WILMA J. SCHNEIDER, and J. C. COWAN

J. Amer. Oil Chem. Soc. 45(7): 534-536. July 1968

Linseed and soybean diethanolamides, from the sodium alkoxide-catalyzed reaction of the corresponding oil with diethanolamine, were used as diols to prepare a series of polyesteramides. The diols and dibasic acids or anhydrides were heated in refluxing xylene until the theoretical amount of water was collected in a trap. Low acid-value linseed polymers were prepared with 10, 20, and 30 mole percent excess diol over the dibasic acid, and the effect of the excess diol on molecular weight, viscosity, and film properties of the polymers was examined. Polyesteramides which contained 10 mole percent excess fatty diethanolamide were made with 11 dibasic acids or an-

hydrides. The polymers were brown-orange oils with Gardner viscosities of Z7 to >>Z10.

Number-average molecular weights ranged from 2,200 to 5,200. Data on drying characteristics, hardness, and chemical resistance of films were obtained. The better polymers air-dried rapidly to give hard, glossy films (Sward rocker 20 to 60). Films baked at 190° C. for 10 minutes were softer than the corresponding air-dried films. Xylene resistance of soybean and linseed polymer films was generally excellent, and alkali resistance was moderate. Soybean films showed the better alkali resistance.

2385 • Predicted and Unpredicted Cross-Reactions of an Acetylphosphogalactan of *Sporobolomyces* Yeast

MICHAEL HEIDELBERGER¹ and MOREY E. SLODKI

(¹New York University School of Medicine, New York)

J. Exp. Med. 128(1): 189-196. July 1968

The teichoic acid of streptococcal Group N, with end groups of galactose phosphate, had been shown to cross-react with antipneumococcal sera of types VI, XIV, XVI, and XXVII. End groups of D-galactose-1-phosphate in the phosphogalactans of *Sporobolomyces* yeasts made it predictable that these galactans would precipitate the same antipneumococcal sera and also antisera to streptococcal Group N. The predictions were verified, and other unpredicted reactions were found. Precipitation of much of the antibody in an antipneumococcal type XVIII horse serum was shown to be due to O-acetyl-D-galactose residues in the

phosphogalactan, in accord with earlier information that an O-acetyl sugar was a principal determinant of S XVIII. The new results identify this sugar as D-galactose. Since it is linked 1,3- in S XVIII, the O-acetyl group in the *Sporobolomyces* galactan is probably also on a 1,3-linked residue. Another major cross-reaction in anti-*S. paratyphi* A serum characterizes the galactose residues in the "O" polysaccharide of the bacillus as members of the D-series probably linked in tandem 1,6-, 1,6-; 1,6-, 1,3-; 1,3-, 1,6-; or 1,3-, 1,3-. Reactions of periodate-oxidized-reduced products confirm the conclusions as stated. Quantitative data are given.

2386 • Grafting Acrylic Acid to Starch by Preirradiation

ZOILA REYES,¹ MARTIN G. SYZ,¹ MAURICE L. HUGGINS,¹ and C. R. RUSSELL

(¹Stanford Research Institute, Menlo Park, Calif.)

J. Polym. Sci., Part C(23): 401-408. 1968

The grafting of acrylic acid (AAc) to starch was investigated with gamma-preirradiated starch and aqueous solutions of AAc. The rate of grafting increased initially with time, then decreased, and approached zero when the percentage grafting reached a maximum value. At a given radiation dose the rate of grafting was proportional to the first power of the concentra-

tion of irradiated starch and to the 1.5 power of the initial concentration of AAc. Solvent effects on degree of grafting, molecular weight, and number of grafted branches were evaluated. Higher degrees of grafting were achieved with electron-irradiated starch at radiation doses lower than those used with gamma rays.

- 2387** • **Some Flow and Solution Properties of Phosphomannan Y-2448**
 F. R. DINTZIS, G. E. BABCOCK, and R. TOBIN
In "Solution Properties of Natural Polymers," Special Pub. 23, pp. 195-206.
 Chemical Society, London. 1968

A program was started at the Northern Laboratory in 1955 to investigate and characterize certain extracellular, nonstarchy polysaccharides that were considered to have industrial potential. Fermentation processes were developed that used either yeasts or bacteria to produce polysaccharides which at low concentrations thicken water. Herein are reported some dilute-solution properties of a phosphomannan polymer produced by the bisexual diploid yeast, *Hansenula holstii* NRRL Y-2448.

Chemical investigations have established much basic information about the structure of polymer Y-2448. Acid hydrolysis and paper chromatography show mannose to be the sole neutral sugar component, and microanalyses show the presence of phosphorus atoms,

potassium atoms, and mannose units in ratios of 1:1:5 in the precipitated potassium salt. A single inflection point at pH 7.2 appears in the potentiometric titration curve of decationized Y-2448 with alkali, and D-mannose-6-phosphate is the only phosphorylated component produced on acid hydrolysis. Available evidence shows that the phosphate occurs as an α -D-mannosyl-1-phospho-6-mannose phosphodiester link within the polymer chain. Periodate oxidation studies on Y-2448 have indicated linkage positions between the mannopyranose units, and a structure sequence has been postulated of an average of five mannose units located between pairs of diester phosphate groups. Some details of the sequences and questions of branching remain to be established.

- 2388** • **Corn Dry-Milling: Stress Crack Formation in Tempering of Low-Moisture Corn, and Effect on Degerminator Performance**
 O. L. BREKKE
 Cereal Chem. 45(7): 291-303. July 1968

Corn of 15% moisture or less often fails to give the desired improvement when tempered under typical conditions used in the dry-milling process. Such corn develops stress cracks during tempering at room temperature. Corn kernels having stress cracks break readily and do not respond properly to degermination. In laboratory studies, stress crack formation varied with initial moisture content of the corn (yellow dent hybrid) and with moisture level, time, and temperature during tempering. In a 2-hour temper with 8% moisture added, kernels having stress cracks increased from between 0 and 5% to more than 60% as the initial moisture content decreased from 20 to 13.5%. For

periods beyond 1 hour for tempering corn at 13.5% moisture, formation of stress cracks increased progressively as the moisture level of tempered corn increased from 15 to 24%. Stress crack formation was temperature-sensitive and was essentially eliminated when the corn was preheated and tempered at 125° F. In pilot-plant tests, yields were improved by preheating and then tempering the corn at 110° to 125° F. before milling. Use of steam-water mixture to simultaneously heat and temper the corn was almost as satisfactory as preheating and tempering the corn in separate steps.

- 2389** • **Chemical Modification of Wheat Gluten Proteins and Related Model Systems**
 J. S. WALL, M. FRIEDMAN, L. H. KRULL, J. F. CAVINS, and A. C. BECKWITH
 J. Polym. Sci., Part C(24): 147-161. 1968

Selected chemical modifications of wheat gluten protein were conducted to provide basic information on its chemistry and behavior and to improve it for various applications. Wheat gluten protein was subjected to acid-catalyzed methanolysis of the numerous side-chain amides of the glutamine residues. The formation of γ -glutamyl methyl ester groups decreased the solubility of the protein in polar solvents and enhanced it in less polar solutions. Reduction and reoxidation of the disulfide bonds of cystine in gluten caused marked changes in the conformation and intermolecular crosslinking of the proteins. The rate and products of reoxidation were determined by concentration of the protein, nature of the solvent, and amino

acid composition of the proteins. The rate of alkylation of polar functional groups of proteins by α,β -unsaturated compounds, such as acrylonitrile, was shown to be determined by the pH, polarity, steric environment, and relative nucleophilicity of the specific group. According to these observations it may be possible to establish conditions in which sulfhydryl groups on proteins could be preferentially alkylated or extensive alkylation of other groups could occur. The polymerization grafting of methyl acrylate to gluten was accomplished by anionic mechanisms in a homogeneous system containing aprotic solvents. Grafting was found to occur on most functional groups.

- 2390** • **From Wild Plants to New Crops in USA**
 GEORGE A. WHITE¹ and IVAN A. WOLFF
 (¹ USDA Crops Research Div., Beltsville, Md.)
 World Crops 20(3): 70-76. June 1968

One of the early objectives of the U.S. Department of Agriculture was to procure, propagate, and distribute among the people new and valuable seeds and plants. The great productivity achieved for our major crop plants, all introduced from other countries, attests to the successful accomplishment of that goal. New germ plasm from foreign sources serves as a useful tool for improving established crops and ornamental plants. Yet until recently the extensive plant introduction program pursued in the United States did not progress much beyond crop improvement. Before the last decade little or no emphasis was placed on the de-

velopment of new crops from essentially wild plants.

New crops may serve industrial, food, feed, or pharmaceutical purposes. The growing demands of industry mean expansion of requirements in both amounts and types of raw materials. Inevitably some of those needs will best be served by agricultural products. So much has recently been written about needs for food and feed for a rapidly increasing populace that the benefits of discovery and development of efficient new plant sources of protein and calories are apparent without elaboration.

2391 • Production of Levoglucosan from Starch by Vacuum Pyrolysis

I. A. WOLFF, D. W. OLDS, and G. E. HILBERT

Staerke 20(5): 150-158. May 1968

Methods are described for the preparation of levoglucosan by destructive distillation of starch *in vacuo* and for purification of the levoglucosan. By pyrolysis of starch under optimum conditions, a 50% yield of levoglucosan can be obtained and about 35% can be recovered in purified form. Pyrolysis is most satisfactory when the starch contains less than 5% moisture, at 390°C. with less than 10 mm. of mercury pressure. Yields of levoglucosan from different starch samples

vary widely even within a given variety. Acid modification or alkaline oxidation of a starch is strongly detrimental to yield. Trace mineral constituents, such as calcium, may increase the yield of levoglucosan from a starch sample; whereas other trace constituents, such as lipids or nitrogen compounds, have no influence. Treating some starch samples with solutions containing calcium salts or sulfur dioxide raises their yield of levoglucosan.

2392 • 3-D-Hydroxypalmitic Acid: A Metabolic Product of the Yeast NRRL Y-6954

R. F. VESONDER, L. J. WICKERHAM, and W. K. ROHWEDDER

Can. J. Chem. 46(15): 2628-2629. August 1968

An extracellular lipid produced by the yeast NRRL Y-6954 was shown to be free 3-D-hydroxypalmitic acid. The structure of the hydroxy acid was estab-

lished by the mass spectrum of its methyl ester and by a direct comparison with an authentic sample of methyl 3-D-hydroxypalmitate.

2393 • X-Ray Diffraction of Oriented Amylose Fibers. III. The Structure of Amylose-*n*-Butanol Complexes

M. E. HINKLE and H. F. ZOBEL

Biopolymers 6(8): 1119-1128. August 1968

Complexes of amylose with *n*-butanol were prepared both as crystalline precipitates and as oriented fibers. These complexes were subjected to x-ray analysis, their unit cells were calculated, and the space group of $P2_12_12_1$ was confirmed. *n*-Butanol com-

plexes exist in both hydrated and anhydrous forms. There is no evidence for methanol, ethanol, or *n*-propanol structures similar to those shown by the *n*-butanol complex. The complexes are unstable in the open air and revert to V-amylose hydrate on standing.

2394 • New Method for Isolation of Grafts of Starch Vinyl Graft Copolymers

L. A. GUGLIEMELLI, M. O. WEAVER, and C. R. RUSSELL

J. Polym. Sci., Part B, 6(8): 599-602. August 1968

Characterization of starch vinyl graft copolymers requires isolation of grafts. A new method to isolate such grafts was developed which is more rapid and complete than enzymolysis and more mild than hydrochloric acid hydrolysis. The starch portion of the copolymer is oxidized with periodate, and when the

resulting dialdehyde moiety is subsequently depolymerized with catalytic amounts of alkali, recovery of the graft is possible. Vinyl polymer components of starch-polyacrylonitrile, starch-poly(methyl methacrylate), and starch-poly(methyl acrylate) graft copolymers are readily isolated by this new method.

2395 • Novel Substrates for Preparing Free Films from Paints or Polymers

R. L. EISSLER

J. Appl. Polym. Sci. 12(8): 1983-1984. August 1968

Using treated glass surfaces as substrates for making free films of paints or polymers overcomes difficulties found in obtaining films by other methods. Glass plates or sheets on which either a fluorochemical-silicone compound or an alkyl quaternary ammonium salt has been adsorbed form surfaces of suf-

ficiently low energy that most films can easily be stripped from them. Each substrate can be reused a number of times. In this laboratory, films of linseed oil paints and several polymers have been prepared on both types of treated glass surfaces.

2396 • Respiratory-Deficient Mutants in *Saccharomyces lactis*

ALBERTA I. HERMAN and PATRICIA S. GRIFFIN

J. Bacteriol. 96(2): 457-461. August 1968

Several environmental conditions reduce viability and increase the rate of recovery of revertants in mating stocks of *Pseudomonas aeruginosa*. Both effects

may modify sex-factor mediated recombination between these strains.

2397 • Isolation and Characterization of the Potato

α -1,4-Glucan- α -1,4-Glucan 6-Glucosyltransferase

H. L. GRIFFIN and Y. VICTOR WU

Biochemistry 7(9): 3063-3072. September 1968

A protein having Q-enzyme activity has been isolated directly from the lyophilized juice of immature potatoes. This procedure involves adsorption of the lyophilized juice on DEAE-cellulose and elution with a linear salt gradient. Cleland's reagent (dithiothreitol) stabilized the activity in the eluate for more than 6 months. The specific activity of the protein can be increased as much as fivefold by using an ultrafiltration technique to remove contaminating peptides. After the protein has been purified, its specific activity is about 17 units/mg. of protein. The enzyme's effect on the iodine affinity of amylose and formation of an amylopectinlike product in its digests with amylose

have been used to characterize the enzyme as a Q-enzyme. The sedimentation coefficient and partial specific volume of the Q enzyme were estimated by zonal and isodensity ultracentrifugation, respectively. The first was carried out in a 5 to 20% linear density gradient of sucrose; the second, in concentrated cesium chloride. A gel-filtration technique has been used to estimate its Stoke's radius. For these parameters, molecular weight (70,000) and frictional coefficient ($f/f_0 = 1.24$) have been calculated. The procedures selected to isolate, purify, and characterize the potato Q enzyme should prove equally adaptable for similar enzymes from other plant sources.

ERRATUM

Northern Utilization Research and Development Division
Publications and Patents - July-December 1968

Pages 13-14: Publications numbered 2399,
2400, 2401, and 2402

References: Change issue to (9) and
month to September.

2398 • Progress—In Food Use of Soybeans

R. J. DIMLER

Oil Mill Gazetteer 73(3): 8-14. September 1968

Soybeans have an essential place in feeding hungry people, both now and in the future. Research on soybeans at the Northern Division includes both food uses and industrial uses. These studies fall into three general areas. One is soybean oil, for which flavor stability

and chemical transformation to industrial products are emphasized. The second is soybean meal and protein, particularly for food and feed uses. The third is the entire bean, including full-fat flour. Recent progress in these three areas is related.

2399 • Differential Thermal Analysis for Evaluation of Copper-Chromium Oxide Catalysts

D. J. MOORE and KARL J. MOULTON

J. Amer. Oil Chem. Soc. 45(8): 639. August 1968

This analysis is helpful in predicting the activity of copper-chromium catalysts that selectively lower the

linolenate content of soybean oil.

2400 • Hydrogen Formation During Hydrazine Reduction of Oleic Acid

E. D. BITNER and H. J. DUTTON

J. Amer. Oil Chem. Soc. 45(8): 603-606. August 1968

Hydrogen has been detected in the gas phase when oleic acid is reduced with hydrazine. The rate of hydrogen production has been followed during this reaction by coupling a gas chromatograph to an automated manometric system. The observation of hydro-

gen evolution alters prior concepts which assume that nitrogen is the only gas given off. Equations involving hydrazine autoxidation, hydrogen production, and reduction of double bonds have been postulated, and their stoichiometry has been studied.

2401 • Cyclic Fatty Acids: Separation from Straight-Chain Fatty Acids by Urea Adducting

R. A. EISENHAUER and R. E. BEAL

J. Amer. Oil Chem. Soc. 45(8): 619-621. August 1968

A mixture containing 37% cyclic and 63% straight-chain fatty acids, made by high-temperature treatment of linseed oil fatty acids with alkali, was separated by the urea adduct method to give unsaturated cyclic fatty acids (nonadduct) in 95% purity and 90 to 95% yield. Previous reports from the Northern Division describe a process for separating cyclic fatty acids from stearic acid by hydrogenation followed by crystallization at -40°C . The urea adduct method avoids

hydrogenation and low-temperature crystallization, and furthermore, unsaturated cyclic and unsaturated straight-chain products can be recovered as individual fractions. Then by readducting the unsaturated straight-chain fatty acid fraction, the small amounts of palmitic and stearic are removed leaving an unsaturated fraction containing oleic, nonconjugated and conjugated linoleic, and some unsaturated cyclic fatty acids.

2402 • High-Yield Preparation of Methyl Stearolate

R. O. BUTTERFIELD and H. J. DUTTON

J. Amer. Oil Chem. Soc. 45(8): 635-638. August 1968

A simplified laboratory procedure for preparing methyl stearolate consists of three steps—bromination, dehydrobromination, and purification. A variety of starting materials were investigated, including oleic acid, olive fatty acids, and triglycerides. Brominations of both fatty acids and triglycerides were conducted in diethyl ether. Dehydrobrominations were carried out in boiling 30% KOH-ethylene glycol solutions or in 30% KOH-water solutions under pressure. Saponification of the triglycerides also occurred at this step.

After conversion to methyl esters and distillation, the product from olive oil analyzed 79% methyl stearolate. Purification was accomplished by either argentation or acetonitrile-hexane countercurrent distribution and yielded methyl stearolate of +99% purity. Overall recoveries, based upon the amount of oleic acid present in the initial oil, averaged 80%. In addition to the laboratory procedure, possible production operations are outlined.

2403 • Structure and Intraglyceride Distribution of Coriolic Acid

W. H. TALLENT, JEANNE HARRIS, G. F. SPENCER, and I. A. WOLFF

Lipids 3(5): 425-430. September 1968

Coriolic [(*R*)-13-hydroxy-*cis*-9,*trans*-11-octadeca-dienoic] acid (III, R=Z=H) was isolated as the methyl ester from two *Coriaria* seed oils in 66 and 68% yields. The double bonds and hydroxyl group were located by periodate-permanganate oxidation before, and chromic acid oxidation after, hydrogenation of the double bonds. Alternatively the positions of the functional groups were indicated by a convenient micro-ozonolysis-gas-liquid chromatographic procedure. De-

termination of products from partial hydrolysis of the *Coriaria* oils with pancreatic lipase (EC 3.1.1.3) revealed an unusual preference of the corioloyl group for the 1,3-positions in triglyceride molecules. This exceptional intraglyceride distribution and other evidence support the involvement of coriolic acid as an intermediate in the biogenetic conversion of linoleic to α -eleostearic acid.

2404 • Degradation of Natural Thioglucosides with Ferrous Salts

F. L. AUSTIN, C. A. GENT, and I. A. WOLFF

J. Agr. Food Chem. 16(5): 752-755. September-October 1968

epi-Progoitrin, the predominant thioglucoside of crambe seed meal, is degraded nonenzymically by ferrous salts to form (*S*)-1-cyano-2-hydroxy-3-butene and (*S*)-3-hydroxy-pent-4-enethionamide. The influence on yields of reactant concentrations, as well as of pH and temperature, has been investigated. Rate studies imply that second-order kinetics are involved in thionamide formation.

Nitriles normally result from the action of ferrous salts on thioglucosides. Thionamide production occurs only with those thioglucosides that possess a hydroxyl group in the 2-position of an alkyl glucosinolate. This structural feature is the same that permits oxazolidinethione formation on enzymic conversion of thioglucosides.

- 2405** • **Protein Quality of Wheat and Soybeans After *Rhizopus oligosporus* Fermentation**
HWA L. WANG, DORIS I. RUTTLE, and C. W. HESSELTINE
J. Nutr. 96(1): 109-114. September 1968

Protein quality of wheat and soybeans fermented with *Rhizopus oligosporus* has been studied by rat assay methods and amino acid analysis. The fermentation process did not significantly change the essential amino acid composition of wheat or a mixture of wheat and soybeans. The growth of rats fed fermented wheat improved significantly over those fed unfermented wheat; also the protein efficiency ratio (PER) of wheat

was increased by fermentation. These improvements were partly attributed to the increase in availability of lysine in wheat by fermentation. A mixture of wheat and soybeans (1:1) gave a good pattern of amino acids. The mixture as a protein source supported growth as well as casein; also, the fermentation process boosted the PER value of the mixture so that it was comparable to casein.

- 2406** • **Fatty Acids, Part 18. An Addition Reaction of Methyl Linoleate Accompanied by Cyclisation**
F. D. GUNSTONE¹ and R. G. POWELL
(¹The University, St. Andrews, Scotland)
Chem. Phys. Lipids 2(2): 203-212. June 1968

Radical addition of acetic anhydride to methyl linoleate yields telomers, 1:2-adducts, and saturated and unsaturated 1:1-adducts. The unsaturated 1:1-adduct is probably a mixture of the four expected products with the side chain attached at C-9, C-10, C-12, or C-13. This conclusion is based on comparison of the reaction product with methyl 9-(carbomethox-

ymethyl)-octadec-12-enoate and methyl 12-(carbomethoxymethyl)-octadec-9-enoate, prepared from the corresponding hydroxy esters by malonation of their mesylates. It is concluded that in the saturated 1:1-adduct the unsaturated five carbon unit of methyl linoleate has been cyclized giving cyclopentane or cyclobutane compounds, or both.

- 2407** • **Determination of the Composition of Uronic Acid Mixtures**
CLARENCE A. KNUTSON and ALLENE JEANES
Anal. Biochem. 24(3): 482-490. September 1968

A method has been developed to determine the relative proportions of three uronic acids in a compound or mixture, which uses data obtained from analysis of samples by the carbazole method under

four different reaction conditions. The method works equally well with synthetic mixtures and natural products, such as alginates.

2408 • A New Modification of the Carbazole Analysis: Application to Heteropolysaccharides

CLARENCE A. KNUTSON and ALLENE JEANES

Anal. Biochem. 24(3): 470-481. September 1968

The carbazole analysis when run at 55° in the presence of borate gives increased sensitivity for D-galacturonic, D-mannuronic, and L-guluronic acids, while greatly decreasing that of D-glucuronic acid. Comparison of values from these reaction conditions with values from other modifications of the carbazole

analysis reveals a high degree of specificity of the reaction for each acid under any defined set of conditions. This specificity is of value for identification of unknown uronic acids. The new modification is especially useful for determination of D-mannuronic acid in heteropolysaccharides.

2409 • Chromatography of Proteins from Wheat Gluten on Polyacrylamide Gel

M. J. A. CROW and J. A. ROTHFUS

Cereal Chem. 45(5): 413-420. September 1968

Glutenin and gliadin fractions from wheat flour and cyanoethylglutenin (CN-glutenin) were chromatographed on polyacrylamide gel in 8 M urea. Glutenin emerged continuously over a range of R_F values from 1.0 to 0.5, consistent with the concept that glutenin is a mixture of materials which have different molecular weights. Examination of reduced and cyanoethylated fractions from glutenin by starch-gel electrophoresis disclosed a deficiency of slow-moving electrophoretic components in fractions containing materials of low molecular weight. CN-glutenin was separated

into three fractions, each of which contained a different mixture of proteins. Comparison of elution patterns for CN-glutenin and gliadin showed that portions of CN-glutenin migrated as particles with apparent molecular weights near 100,000 and 40,000. The heavier fraction contained the major electrophoretic components in CN-glutenin; the lighter, fewer components that migrated slowly upon electrophoresis. Chromatography of the viscous solutions of wheat gluten proteins was facilitated by supporting the polyacrylamide gel with glass beads.

2410 • Sexual Agglutination in Yeast. VII. Significance of the 1.7S Component from Reduced 5-Agglutinin

NEIL W. TAYLOR and WILLIAM L. ORTON

Arch. Biochem. Biophys. 126(3): 912-921. September 1968

The sex-specific agglutinin from mating type 5 of *Hansenula wingei* was purified by absorption on, and elution from, cells of type 21. When purified 5-agglutinin was reduced with thiols, its ability to agglutinate type 21 was destroyed and approximately six small fragments ($s_{25} = 1.7S$, $M = 12,000$) were released from the major reduced component. Approximately five disulfide bonds were present in the average 5-agglutinin particle, as estimated from ^{35}S label. Allowing for variation among different preparations, it appears that each particle of 1.7S component is linked to the major reduced component by one disulfide bond.

After fractionation, neither the 1.7S reduced component nor the major one was specifically absorbed by type 21 cells, but mixtures of both components were partially absorbed by type 21 cells after the disulfide bonds had been reformed by oxidation. It is concluded that the 1.7S component is not the complete combining site of 5-agglutinin but that both reduced components carry parts of the combining site, which is stabilized by the disulfide bond joining them.

2411 • Microbial Polysaccharides

ALLENE JEANES

In "Encyclopedia of Polymer Science and Technology," vol. 8, chairman editorial board, Herman F. Mark, pp. 693-711. New York. 1968

Polysaccharides are normal constituents of all microbial cells, including those of bacteria, yeasts, and other fungi. These polysaccharides, which represent numerous compositional classes, are present in significant proportions in one or more of the major parts of the cell, or sometimes in all parts. The locality, either within the cell or external to it, where microbial poly-

saccharides occur provides a basis for their classification. This method of classification is described along with some representative polysaccharide constituents, their apparent functions, and how they may be isolated. The extracellular polysaccharides, being of particular interest, comprise the bulk of this article.

2412 • Solvent Effects in Reactions of Protein Functional Groups

MENDEL FRIEDMAN

Quart. Rep. Sulfur Chem. 3(2): 125-144. 1968

The course of numerous chemical reactions is profoundly altered when carried out either in dimethyl sulfoxide (DMSO) or in the presence of DMSO. Two main factors are responsible for the solvent effects on chemical reactivities: (1) The preferential solvation of positive charges by DMSO leaves negative charges and other nucleophilic centers in both ground and transition states free from destabilizing influences of positive charges and ion-pair aggregations; and (2) the strong dipole of the sulfoxide group in DMSO acts as a hydrogen-bond acceptor and alters acid-base equilibria, nucleophilic and electrophilic reactivities of reactants, and stabilities of transition states.

These factors imply that chemical reactivities of protein functional groups should be subject to strong DMSO-solvent effects because: (1) Proteins are polyelectrolytes in which the unequal distribution, except at the isoelectric point, of positive and negative charges is a function of the amino acid composition of a particular protein; (2) hydrogen-bonding and hydropho-

bic interactions of peptide bonds and side chain groups are responsible for conformations that proteins assume in solution; in turn, the degree of helicity and folding of a protein influences chemical reactivities of functional groups on the same or in different polypeptide chains; and (3) the degree of ionization of protein functional groups, which determines the concentration of nucleophilic species at any pH, and the inherent nucleophilic reactivities of protein functional groups, should relate to the dielectric constant, dipole moments, and hydrogen-bonding abilities of their solvent environment.

In this brief survey on the effect of DMSO and related solvents on chemical reactivities of functional groups present in amino acids, peptides, and proteins, an attempt is made, wherever possible, to delineate the mechanism of interaction of these solvents. Hopefully, this review will stimulate additional studies in this research area which is as yet relatively unexplored.

2413* • Mycotoxins

C. W. HESSELTINE

Proc. 6th Eur. Feed Congr., Brighton, England, Sess. III/1, pp. 1-11, i-iii. 1968

This brief review covers the various mycotoxins currently being investigated, particularly the aflatoxins. Emphasis is placed on the problem of aflatoxins

as they affect domestic animals and the environmental conditions influencing the formation of aflatoxin.

2414 • Aminoethylation and Fractionation of Glutenin.**Evidence of Differences from Gliadin**

JOHN A. ROTHFUS and M. J. A. CROW

Biochim. Biophys. Acta 160(3): 404-412. August 1968

After reduction and aminoethylation, glutenin can be separated into four groups of proteins by fractional precipitation from 0.5 M acetic acid solution with $\text{Cu}(\text{NO}_3)_2$. The material precipitated by 0.0283 M $\text{Cu}(\text{NO}_3)_2$ accounts for 22% (w/w) of the glutenin and consists primarily of slow-moving electrophoretic components. This fraction, which has an amino acid composition unlike other proteins from gluten, contains

large amounts of glycine and tyrosine and low levels of histidine, methionine, valine, and cysteine. The remaining fractions from glutenin resemble other gluten proteins more closely in composition. Gel permeation chromatography of the protein components from glutenin shows they have higher apparent molecular weights than gliadin.

2415 • Addition of Halogenated Acetic Acids to Vinyl Ketones. A Nuclear Magnetic Resonance Study of the Kinetics

DAVID WEISLEDER and MENDEL FRIEDMAN

J. Org. Chem. 33(9): 3542-3543. September 1968

The kinetics of the addition of CF_3COOH (I) to $\text{CH}_2=\text{CHCOCH}_3$ (II) to form $\text{CF}_3\text{COOCH}_2\text{CH}_2\text{COCH}_3$ (III) were investigated by a nuclear magnetic resonance (NMR) technique. The reaction was followed by observing a decrease in NMR signal from the methyl peak of II at $\tau 7.55$ and a concurrent increase in the corresponding signal from III at $\tau 7.63$ as a function of time. An analysis of the kinetic data indicates that the reaction does not proceed to completion. Instead,

equilibrium is reached after 24 hours with around 90% reaction at a 2:1 ratio of I to II, and with 76% reaction at a 1:1 ratio. Relative reactivities of I and a series of halogenated acetic acids with II directly relate to pK_a values of the acids. Mechanistic aspects and the potential synthetic utility of the addition reaction of halogenated acetic acids to conjugated systems are discussed.

2416 • Restoration of Transmission to Silver Chloride Plates

DONALD TRIMNELL

Appl. Spectrosc. 22(4): 344. July-August 1968

The method discussed of restoring transmission to silver chloride plates combines the advantages of chemical and mechanical action, is simple and easy to use, and involves a minimum of toxicity hazards. This

method in both removing tarnish and eliminating scratches restores transmission and increases the effective life of the plates.

- 2417 • Aflatoxins B₁, B₂, G₁, and G₂: Separation and Purification**
 R. D. STUBBLEFIELD, O. L. SHOTWELL, and G. M. SHANNON
 J. Amer. Oil Chem. Soc. 45(10): 686-688. October 1968

Aflatoxins B₁, B₂, G₁, and G₂ have been separated on a series of chromatographic columns. Chromatography of crude products isolated from molded wheat and rice on silicic acid with washed chloroform: ethanol (99:1) gave relatively pure B₁. The rest of the column fractions containing predominantly G₁, along with B₁, B₂, and G₂, were pooled and fractionated on a silica gel column. The mobile phase was washed

chloroform:acetone:ethanol (97.3:2.0:0.75). Thin-layer chromatography was used to follow column development. Each of the aflatoxins was treated with either decolorizing carbon or copper carbonate to remove colored pigments, and rechromatographed on silica gel. Crystalline aflatoxins were prepared from chloroform solutions by addition of η -hexane, methanol, or ethanol.

- 2418* • Oxidation by Atmospheric Oxygen (Autoxidation)**
 J. C. COWAN
In "Fatty Acids. Part 5, Their Chemistry, Properties, Production, and Uses,"
 2nd ed., rev. and enl., ed. Klare S. Markley, pp. 3685-3713. New York. 1968

A review of advances in research on the autoxidation of fats from 1960 to 1965 is given with sections on developments in the hydroperoxide theory, primary

and secondary oxidation products, catalysts, analyses, and prostaglandins.

- 2419 • Isolation, Separation, and Analysis of the Aflatoxins**
 ODETTE L. SHOTWELL
 Proc. 1967 Mycotoxin Res. Seminar, held at Washington, D.C., June 8-9, 1967
 U. S. Dept. Agr., pp. 51-56. September 1968

In a survey of oats for the presence of aflatoxin, initial studies indicated that a third of the samples contained nontoxic fluorescing substances which behaved like aflatoxins on thin-layer chromatographic plates developed in six of the eight solvent systems tried. These substances did not separate from aflatoxin by the extraction or column chromatographic methods tried. However, the factors in oats that interfere with the assay for aflatoxin can be differentiated from aflatoxin on thin-layer plates developed with 5 or 7% methanol in chloroform. Crude products containing

mixtures of aflatoxins can be purified and aflatoxins separated by chromatography on silicic acid, silica gel, and alumina. Analytically pure aflatoxins B₁ and G₁ have been prepared, and B₂ has been crystallized. A survey to find aflatoxin M-producing strains of *Aspergillus flavus* has been initiated. Each organism is being studied on three substrates: a liquid medium and on solid media of either rice or wheat. The first five organisms tried are all known producers and do form small amounts of aflatoxin M.

2420 • Microbiological Research on Mycotoxins at the Northern Utilization Research and Development Division

C. W. HESSELTINE

Proc. 1967 Mycotoxin Res. Seminar, held at Washington, D.C., June 8-9, 1967
U.S. Dept. Agr., pp. 17-22. September 1968

This paper describes the progress made in inactivating aflatoxin with microorganisms and in the mode of action of aflatoxin on aflatoxin-sensitive bacteria. It reports that aflatoxins can be formed by *Aspergillus flavus* on certain forages when they are moistened and

describes the method of aflatoxin analysis of forages. The consistent yields of aflatoxins by certain strains of *A. flavus* are reported. Also, the findings of our research contract on mycotoxins in the genus *Aspergillus* are summarized.

2421 • Using a Bostwick Consistometer To Measure Consistencies of Processed Corn Meals and Their CSM Blends

G. N. BOOKWALTER, A. J. PEPLINSKI, and V. F. PFEIFER

Cereal Sci. Today 13(11): 407-410. November 1968

The Bostwick consistometer was tested and adapted for use in CSM food blends. CSM is a mixture of corn, soy flour, and nonfat dry milk with the necessary

vitamins and minerals added. Specific conditions are defined for measurement of uncooked and cooked consistency values.

2422 • Publications and Patents of the Northern Utilization Research and Development Division, January-June 1968

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., Unnumb. Pub., 40 pp. [July 1968]

2423 • Stereospecific Hydrogenation of Stearolate With Copper Catalysts

SAMBASIVARAO KORITALA

J. Amer. Oil Chem. Soc. 45(10): 708. October 1968

Unsaturated fatty acids are generally synthesized from their corresponding acetylenic acids. The catalysts used for the hydrogenation of the triple bond to *cis* double bond also produced some undesirable *trans* double bonds and saturated acids. It was shown that commercial copper chromite on supported copper

catalysts stereospecifically adds hydrogen to stearolate to form oleate without the formation of the *trans* isomers or saturates. With copper catalysts the triple bond in stearolate was preferentially reduced over the double bonds in linoleate.

2424 • A Unique Gas Chromatographic Stationary Phase

V. L. DAVISON and D. J. MOORE

J. Gas Chromatogr. 6(11): 540-542. November 1968

A polymeric gas-chromatographic stationary phase, crosslinked during column conditioning, provides a

thermally stable substrate for special temperature-programmed analyses.

2425 • Isolation and Biological Activity of a Microbial Conversion Product of Aflatoxin B₁

R. W. DETROY and C. W. HESSELTINE

Nature 219(5157): 967. August 31, 1968

A new, blue-fluorescent compound has been produced by incubating aflatoxin B₁ with a steroid-hydroxylating fungi, *Dactylicum dendroides*. The compound, purified on a silica gel column, possessed dif-

ferent ultraviolet and infrared absorption maxima than parent B₁. The biological toxicity of the new conversion product (Ro) is 18 times less toxic than aflatoxin B₁.

2426* • Nutrient Utilization: YeastsLYNFERD J. WICKERHAM and R. J. ALLGEIER¹(¹Catonsville, Md.)

In "Metabolism," eds. Philip L. Altman and Dorothy S. Dittmer, pp. 206-209.

Fed. Amer. Soc. Exp. Biol., Bethesda, Md. 1968

Differentiation of yeast species may be made by determining their ability to produce gaseous fermentations and to assimilate carbohydrates or other carbon

compounds. Tabular data are assembled separately under these three categories.

2427 • Structure of the Extracellular Bacterial Polysaccharide from *Arthrobacter viscosus* NRRL B-1973

J. H. SLONEKER, DANUTE G. ORENTAS, C. A. KNUTSON, P. R. WATSON, and ALLENE JEANES

Can. J. Chem. 46(21): 3353-3361. November 1968

D-Glucose, D-galactose, and D-mannuronic acid in equimolar proportions constitute 75% of the weight of the polysaccharide elaborated by *Arthrobacter viscosus* NRRL B-1973. O-Acetyl groups account for the remaining 25% of the weight; 50% of the hydroxyl groups are acetylated. Acid hydrolysis of the polysaccharide revealed that the D-mannopyranosyluronic acid bonds hydrolyzed with unexpected ease. Controlled acid hydrolysis afforded three oligosaccharides identified as 4-O- β -D-glucopyranosyl-D-galactose; 4-O- β -D-mannopyranosyluronic acid-D-glucose; and O- β -D-mannopyranosyluronic acid-(1 \rightarrow 4)-O- β -D-glucopyranosyl-(1 \rightarrow 4)-D-galactose. The native polysaccharide was oxidized slowly by sodium metaperiodate and consumed 0.42 mole per sugar residue in 340 hours at 4⁰. The deacetylated polysaccharide consumed

0.67 mole of periodate per sugar residue and produced 1 mole of acid per 160 to 165 sugar residues in 170 hours at 4⁰. At 20⁰ the deacetylated polysaccharide was oxidized excessively by periodate, 1.5 moles of oxidant was consumed, and 0.4 mole of acid was produced per sugar residue in 340 hours. However, only 20% of the C₄-substituted D-glucose residues in the polysaccharide was cleaved by periodate in spite of the excessive oxidation at 20⁰.

The polysaccharide has a linear structure and consists predominantly of repeating trisaccharide units, O- β -D-mannopyranosyluronic acid-(1 \rightarrow 4)-O- β -D-glucopyranosyl-(1 \rightarrow 4)-D-galactose.

2428 • Preparation and Characterization of Two 1,2:5,6-Di-O-bromoethylidene-D-mannitols

H. B. SINCLAIR

J. Org. Chem. 33(10): 3714-3718. October 1968

When bromoacetaldehyde diethyl acetal was treated with D-mannitol in 18 *N* H₂SO₄, a solid was isolated, melting point 135° to 145°, and analyzed for a di-O-bromoethylidenehexitol. Concentration of the mother liquors gave a solid, melting point of 100° to 120°. After four to six recrystallizations, from 1% w/v water, compounds having melting points 119° to 120° and 154° to 155° were isolated. Both isomers on catalytic hydrogenolysis, methylation, and hydrolysis

gave 3,4-di-O-methyl-D-mannitol. Both isomers gave crystalline di-O-*p*-tolylsulfonyl and di-O-acetyl derivatives, which exhibited different melting points. Nuclear magnetic resonance spectroscopy was used to assign to the low-melting isomer the *cis*-1,2:*trans*-5,6-di-O-bromoethylidene-D-mannitol structure and to the high-melting isomer the *cis*-1,2:*cis*-5,6-di-O-bromoethylidene-D-mannitol structure.

2429 • Gas Chromatography of Carbohydrates

J. H. SLONEKER

In "Biomedical Applications of Gas Chromatography," ed. Herman A. Szymanski, vol. 2, pp. 87-135. New York. 1968

Methods for preparing volatile sugar derivatives, including descriptions and use of new reagents, are discussed. Application of these techniques to the

qualitative and quantitative analysis of mono- and oligosaccharides are reviewed with particular emphasis on the biomedical application.

2430 • How Extrusion Cooking Varies Product Properties

H. F. CONWAY, E. B. LANCASTER, and G. N. BOOKWALTER

Food Eng. 40(11): 102-104. November 1968

Equipment is described in which corn products for CSM, a formulation of corn, soy flour, and nonfat dry milk for world-wide infant and child feeding were

made. Methods of operation and their effects on the properties of the products are discussed.

2431 • Linkages in the Walls of *Rhodospirillum rubrum* and Its Bacilliform Mutants

J. W. NEWTON

Biochim. Biophys. Acta 165(3): 534-537. October 1968

The peptidoglycan portion of the cell walls of *Rhodospirillum rubrum* and its bacilliform mutants

was studied. Walls of spiral-shaped organisms were found to be extensively crosslinked.

2432 • Research in Soybean Utilization

V. L. DAVISON

Soybean Dig. 29(2): 8-9. December 1968

New and improved products and uses are being made available by research at the Northern Division to keep soybeans from saturating the market. Among the products to help broaden the market for soybeans is the food supplement CSM (corn-soya-milk), a pro-

tein-enriched powder prepared from a spray-dried mixture of bananas and soy protein isolate, the economical village process for producing soy flour in primitive areas, and nylon-9 from soybean oil, with applications such as coatings and gears.

2433 • Agglutinability of Sporeforming Insect Pathogens with Antiglobulins to Milky Disease Bacteria

G. R. HRUBANT and R. A. RHODES

J. Invertebr. Pathol. 11(3): 371-376. September 1968

Antiglobulins to vegetative cells and to intact spores of *Bacillus popilliae* and *Bacillus lentimorbus* were used to study the antigenic relationship of milky disease bacteria with other sporeforming bacilli. Vegetative cells from 12-hour cultures were used as test antigens. The species of milky disease organisms were serologically distinct with neither vegetative cells nor spores exhibiting cross reactivity. However, *B. popilliae*

was related to several other sporeforming insect pathogens, both those with swollen sporangia and those with crystalliferous inclusions. *Bacillus* larvae was serologically related to both organisms. Of the *Bacillus* species nonpathogenic for insects, no strain tested agglutinated with any of the antiglobulins to the milky disease bacteria.

2434 • Self-Help Soybean Mill—New Weapon Against Hunger

EDWARD L. GRIFFIN, JR., and DEAN H. MAYBERRY

Yearbook Agr., 1968

U.S. Dept. Agr. Pp. 256-258

The world faces serious food shortages, especially in developing nations. Their most critical deficiency is dietary protein. Since the soybean supplies this need when properly processed, the Agency for International Development financed such research at the Northern Division. A village process was developed that uses

simple equipment to convert soybeans to a palatable, nutritious flavor. All the equipment can be operated manually and is nominal in cost. Villagers using the self-help mill make soy flour that contains a high dietary protein.

2435 • A 'Cure' for Concrete Soothes Motorist Too

JOHN C. COWAN

Yearbook Agr., 1968

U.S. Dept. Agr. Pp. 161-165

Each spring the ravages of winter appear on the Nation's highways, particularly on bridges, as concrete scaling and spalling. Although salting streets and highways makes motoring safer, salting also increases scaling and the cost of bridge and road maintenance. Linseed oil, diluted with solvents or emulsified in

water, coats and penetrates the surface of concrete. The oil forms a coat that retains moisture necessary for curing concrete and retards scaling. In the bargain, the oil improves abrasion resistance and paint adherence of concrete.

2436 • Dextran Helps Save Lives

ROBERT J. DIMLER

Yearbook Agr., 1968

U.S. Dept. Agr. Pp. 314-317

The story of how a woman from Texas, Allene Jeanes, combined her scientific abilities in carbohydrate chemistry to fill a national need for a blood-plasma extender—dextran. Dextran is a polysaccharide produced by a harmless bacterium. The linkages in the molecular structure of dextran are similar to special ones in starch, a carbohydrate. Studies by Dr. Jeanes

on the structure of the 1,6-linkage in starch enabled her to find a source of 1,6-linked carbohydrate material in dextran. The dextran-producing organisms she selected, the culture conditions she established, and the chemical methods she used to characterize dextran have all been taken over in their entirety into an item of commerce.

2437 • Penicillin: Breakthrough to the Era of Antibiotics

FRANK H. STODOLA

Yearbook Agr., 1968

U.S. Dept. Agr. Pp. 339-344

The history of the penicillin development is reviewed, particularly the part played by the Northern Regional Research Laboratory in laying the foundations for large-scale production during World War II.

Also discussed are the new penicillins that have been developed for oral use, for control of resistant organisms, and for reduction or elimination of hypersensitivity reactions.

- 2438** • **Aflatoxin B₁ Binding and Toxic Effects on *Bacillus megaterium***
 E. B. LILLEHOJ and A. CIEGLER
 J. Gen. Microbiol. 54, Part 2: 185-194. December 1968

A study was made of the binding of aflatoxin B₁ and its toxic effects on *Bacillus megaterium* NRRL B-1368. After a 12-hour incubation period, 5 µg. aflatoxin B₁/ml. inhibited growth of the test organism 95%. Viable organisms decreased from 3.8 X 10⁷/ml. in the controls to 5.0 X 10⁴/ml. in a growth medium containing 50 µg. aflatoxin B₁/ml., after 4 hours of incubation. Viability was not significantly decreased, however, when the organisms were incubated with the same concentration of toxin either under nitrogen, or at 5° C., or in the presence of bacteriostatic concentrations of tetracycline. Binding experiments showed that 4.0 X 10⁹ organisms/ml.

took up approximately 7.0 µg. aflatoxin B₁/ml. After five aqueous washes of the organisms, 20 to 25% of the toxin remained bound to them. The tightly bound toxin was removed by ultrasonic treatment of the organisms and by chloroform extraction of the macerate. Removal of cell walls by lysozyme following toxin uptake released 23% of the initially bound toxin, and osmotic rupture of the protoplasts an additional 7%. Toxin was also taken up by intact and by ruptured protoplasts. Removal of nucleic acids from the membranes did not alter their capacity to bind aflatoxin B₁.

- 2439** • **Storage Stability of Blended Food Products, Formula No. 2: A Corn-Soy-Milk Food Supplement**
 G. N. BOOKWALTER, H. A. MOSER, V. F. PFEIFER, and E. L. GRIFFIN, JR.
 Food Technol. 22(12): 1581-1584. December 1968

CSM, a high-protein food supplement for preschool children consisting of partially gelatinized corn meal, toasted soy flour, and nonfat dry milk, fortified with vitamins and minerals, was tested for storage stability. Commercial and laboratory-formulated mixtures were tested at 77°, 100°, and 120° F. in sealed containers. At approximately 10% moisture, samples maintained

adequate stability for 365 days at 77° F., for 6 months at 100° F., and for 8 weeks at 120° F. CSM was more stable when held at 5% moisture under the same conditions, except peroxide values of the extracted fat increased. At 13-1/2% moisture, CSM was less stable as measured by tests for flavor, vitamin A, thiamine available lysine, and free fatty acids in extracted fat.

- 2440** • **Reaction of Starch with Carbohydrate *trans*-Carbonates**
 W. M. DOANE, B. S. SHASHA, E. I. STOUT, C. R. RUSSELL, and C. E. RIST
 Carbohydr. Res. 8(3): 266-274. November 1968

Mono- and polysaccharides possessing certain substituted, vicinal, *trans*-hydroxyl groups are readily substituted onto starch. Such substitution occurs when a *trans*-fused, cyclic carbonate derivative of the saccharide is added to starch in the presence of a basic catalyst. Excellent yields of products result on addition of methyl 4,6-*O*-benzylidene- α -D-glucopyranoside 2,3-carbonate (or 2,3-thionocarbonate), and methyl 2,6-

di-*O*-(methylsulfonyl)- α -D-glucopyranoside 3,4-carbonate to starch in the presence of triethylamine. Dextrin carbonate of degree of substitution (DS) 0.40 and dextran carbonate of DS 0.31 react with starch under various conditions, in the presence of different catalysts, to give the corresponding polysaccharide copolymers.

- 2441** • **Starch Hydrolysis by Conidia of *Aspergillus wentii***
D. E. JOHNSON, G. E. N. NELSON, and A. CIEGLER
Appl. Microbiol. 16(11): 1678-1683. November 1968

Soluble starch was hydrolyzed to glucose by conidia of *Aspergillus wentii* NRRL 2001. Peak yields of glucose were achieved in 3 days. A glucoamylaselike enzyme was assumed to be responsible since maltose was not detected during the conversion. Spore age, storage conditions, and temperature affected the level

of glucose accumulated. Iodoacetate inhibited catabolism of the glucose formed, and this inhibition increased product yield. Spores of other fungi also hydrolyzed starch, but none accumulated glucose naturally as did *A. wentii* spores.

- 2442** • **In Vivo Activity of Propolis against *Bacillus* larvae**
L. A. LINDENFELSER
J. Invertebr. Pathol. 12(1): 129-131. October 1968

Since propolis in solution had demonstrated *in vitro* activity previously against *Bacillus larvae*, the causative agent of American foulbrood in the honey bee, tests were conducted to determine its *in vivo* effectiveness. Solutions of propolis were administered in various concentrations to infected colonies, both by feeding in syrup and by spraying diseased combs.

With either test method, a solution containing 500 $\mu\text{g./ml.}$ of propolis apparently suppressed the disease

during the treatment period. However, there was little inclination by adult bees to remove infected larvae which remained as sources for reinfection after treatment ceased. On the other hand, a control colony that had received sulfa therapy during the same test period apparently recovered completely. No toxic effects on adult bees were noted. Many deformed young bees emerged during and following the period when propolis was fed at the 500 $\mu\text{g./ml.}$ level.

- 2443** • **Improved Stability and Film Properties of Emulsion Coatings Through Reversed Encapsulation**
L. H. PRINCEN, J. A. STOLP, and R. ZGOL
J. Colloid Interface Sci. 28(3-4): 466-474. November-December 1968

Viscosity-stable emulsion paints that produce glossy films have been produced by reverse encapsulation. This process has been accomplished without aggregation by dispersing pigments in a hexane solution of 10% linseed oil, based on the weight of the pigment. The suspension is emulsified in water, and the hexane evaporated under vacuum at ambient or slightly increased temperature. Additional oil is emulsified directly into the suspension to form a paint that main-

tains viscosity at neutral pH and the films of which are semiglossy to glossy in appearance. The coatings system consists essentially of an emulsion in which part of the droplets contain pigment particles. Since pigments are not in direct contact with water, they do not exhibit the reactivity that may result in increased pH, viscosity, and sedimentation volume in conventional aqueous paints.

2444 • Compositional Data on Sunflower Seed

F. R. EARLE, C. H. VanETTEN, T. F. CLARK, and I. A. WOLFF
 J. Amer. Oil Chem. Soc. 45(12): 876-879. December 1968

Comparative data are provided on the composition of achenes from sunflower varieties Armavirec, Peredovik, VNIIMK 8931, Smena, Krasnodarets, Arrowhead, and Mingren. Hand-separated achene components were analyzed. Kernel oil from seed raised in northern United States or southern Canada typically contains around 70% linoleic acid. In addition to other common acids, traces of C_{17} , C_{20} , C_{22} , C_{24}

acids and linolenic acid are present. The amino acid composition of sunflower kernel protein suggests that the meal may be a valuable ingredient of high-quality feed or food materials. The hull is primarily cellulose, lignin, and pentosans; hull lipid and protein differ in composition from the corresponding kernel constituents.

2445 • Hydrolytic, Reductive and Pyrolytic Decomposition of Selected Ozonolysis Products. Water as an Ozonization Medium

E. H. PRYDE, D. J. MOORE, and J. C. COWAN
 J. Amer. Oil Chem. Soc. 45(12): 888-894. December 1968

Hydrolytic, reductive, and pyrolytic decompositions of ozonolysis products formed in water were surveyed as potential preparative routes to aldehydes. Water is an effective ozonolysis medium and reacts with the transient zwitterion formed during ozonolysis in the same manner as participating solvents. Reductive decomposition proved to be superior to either hydrolytic or pyrolytic decomposition for the prepar-

ation of aldehydes. Pyrolytic decomposition, as carried out in the injection port of a gas chromatograph, gave varying amounts and products depending upon the type of ozonolysis product used. Interconversion of the various ozonolysis products, including ozonides, methoxy hydroperoxides, acetoxy hydroperoxides, and hydroxy hydroperoxides, does not occur except under acid catalysis.

2446 • Determination of Copper in Edible Soybean Oils

G. R. LIST, R. L. HOFFMANN, W. F. KWOLEK,¹ and C. D. EVANS
 (¹ USDA Biometrical Serv., Peoria, Ill.)
 J. Amer. Oil Chem. Soc. 45(12): 872-875. December 1968

Soybean oils have been analyzed for their copper content before and after hydrogenation with copper-containing catalysts. A low-temperature dry asher, an apparatus in which oxygen plasma is generated in a radio-frequency field under high vacuum, was adopted for ashing glyceride oils. The residues were analyzed by a colorimetric procedure in which zinc dibenzylthiocarbamate is used as the reagent. Identical samples were analyzed without ashing by neutron activation and atomic absorption techniques. The accuracy of the methods was determined by adding known amounts

of copper at four different levels to two different soybean salad oils. Plots of copper found versus copper added showed that results were consistent over the range 0.04-5.0 p.p.m. for all three methods, although the atomic absorption results were low. The relative error of a single determination was $\pm 13\%$ and that of the mean of duplicate determinations $\pm 9\%$. Natural soybean oils had a copper content of about 0.03-0.10 p.p.m., whereas the same oils hydrogenated with copper-containing catalysts and without metal-removal treatments had levels of 3 to 5 p.p.m.

- 2447** • **Oxygenated Fatty Acids of Oil From Sunflower Seeds After Prolonged Storage**
K. L. MIKOLAJCZAK, R. M. FREIDINGER, C. R. SMITH, JR., and I. A. WOLFF
Lipids 3(6): 489-494. November 1968

Chemical analysis of a number of sunflower (*Helianthus annuus*) seed oil samples revealed a low and variable percentage of hydrogen bromide-reactive material. To characterize the compounds responsible for this reactivity, oil was extracted from selected introductions from Uruguay, Turkey, and Yugoslavia that had been subjected to prolonged storage. Two epoxy fatty acids and two conjugated dienolic acids were isolated from the methyl esters derived from these sunflower seed oils by using a combination of column chromatography and countercurrent distribution. The epoxy acids are *cis*-9,10-epoxystearic acid (0.5%) and *cis*-9,10-epoxy-*cis*-12-octadecenoic (coronarinic) acid (2.2%). Characterization of the dienols re-

vealed that they are 9-hydroxy-*trans*-10,*cis*-12-octadecadienoic acid (1.2%) and 13-hydroxy-*cis*-9,*trans*-11-octadecadienoic acid (1.3%). Fresher seed of some of these introductions contained less of the oxygenated components.

Oils from recently produced seed of selected high-oil Russian sunflower varieties, including some currently grown in the United States, contained no more than trace amounts of oxygenated acids. Although the relative contributions of genetic and environmental factors toward genesis of oxygenated acids are not established, increase of those acids has been demonstrated in some sunflower lines as a result of storage.

REPUBLICATIONS

- 1869** • **Flavor Evaluation of Natural Soybean Oils of High and Low Linolenate Content**
C. D. EVANS, HELEN A. MOSER, D. G. MC CONNELL, J. C. COWAN,
J. L. Cartter,¹ and F. I. COLLINS¹
(¹U.S. Regional Soybean Laboratory, Urbana, Ill.)
Oils Oilseeds J. (Bombay) 18(12): 11-14. June 1966

The original article appeared in the Journal of the American Oil Chemists' Society 42(8): 736-738. August 1965.

- 2272** • **The Microbiological Population of Wheat and Wheat Flour**
[V. F. PFEIFER and CHARLES VOJNOVICH]
Milling 150(6): 50, 52, 53, June 1968

Originally published as "Reducing the Microbial Population of Wheat and Wheat Flour" in Bull. Ass.

Oper. Millers: 3022-3024. January 1968.

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 193-C** • **Modification of the Maes Continuous-Extraction Process for Fractionation of Hard Red Winter Wheat Flour Proteins**
PAUL J. MATTERN, ALI SALEM, and GEORGE H. VOLKMER
University of Nebraska, Lincoln
Cereal Chem. 45(7): 319-328. July 1968
- 194-C** • **Investigation of Ultra-Low Temperature for Fungal Cultures.**
I. **An Evaluation of Liquid-Nitrogen Storage for Preservation of Selected Fungal Cultures**
SHUH-WEI HWANG
American Type Culture Collection, Rockville, Md.
Mycologia 60(3): 613-621. May-June 1968
- 195-C** • **Investigation of Ultra-Low Temperature for Fungal Cultures.**
II. **Cryo-Protection Afforded by Glycerol and Dimethyl Sulfoxide to 8 Selected Fungal Cultures**
SHUH-WEI HWANG and ANN HOWELLS
American Type Culture Collection, Rockville, Md.
Mycologia 60(3): 622-626. May-June 1968
- 196-C** • **Stabilization of Crude Carotene-Containing Mycelium**
CHARLES J. GOGK
Arthur D. Little, Inc., Cambridge, Mass.
J. Agr. Food Chem. 16(5): 730-734. September-October 1968
- 197-C** • **Amino Acid Composition of Selected High-Protein Wheats**
P. J. MATTERN, ALI SALEM, V. A. JOHNSON, and J. W. SCHMIDT
University of Nebraska, Lincoln
Cereal Chem. 45(5): 437-444. September 1968
- 198-C** • **The Synthesis of Methyl 3-O-Ethyl- α -D-Glucopyranoside**
J. T. MARVEL, S. K. SEN, J. W. BERRY, and A. J. DEUTSCHMAN, JR.
University of Arizona, Tucson
Carbohydr. Res. 8(2): 148-156. October 1968.

[Report of research work done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 28-G*** ● **Genetic Variations in Maize: Effects on the Properties of the Starches**
R. M. SANDSTEDT, B. D. HITES, and HELEN SCHROEDER
University of Nebraska, Lincoln
Cereal Sci. Today 13(3): 82-85, 88, 90-92, 94, 156. March 1968
- 29-G*** ● **The Carbohydrate-Polypeptide Linkages in a Fungal Glucoamylase**
D. R. LINEBACK
University of Nebraska, Lincoln
Carbohydr. Res. 7(1): 106-108. May 1968
- 30-G*** ● **Photochemical Addition of Phosphines to 5,6-Dideoxy-1,2-O-isopropylidene- α -D-xylo-hex-5-enofuranose**
ROY L. WHISTLER, CHIH-CHENG WANG, and SABURO INOKAWA
Purdue University, Lafayette, Ind.
J. Org. Chem. 33(6): 2495-2497. June 1968
- 31-G** ● **Reaction of 3,4-Dihydro-2H-pyran with Methyl α -D-Glucopyranoside**
M. L. WOLFROM, ANNE BEATTIE, S. S. BHATTACHARJEE, and G. G. PAREKH
The Ohio State University, Columbus
J. Org. Chem. 33(10): 3990-3991. October 1968
- 32-G*** ● **Synthesis of Sugar Analogs with Phosphorus as the Ring Heteroatom**
ROY L. WHISTLER and CHIH-CHENG WANG
Purdue University, Lafayette, Ind.
J. Org. Chem. 33(12): 4455-4458. December 1968
- 33-G** ● **Inhibitory Cell Products: Their Formation and Some New Methods of Removal**
R. K. FINN
Cornell University, Ithaca, New York
J. Ferment. Technol. 44(6): 305-310. June 1966

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

- 235-F*** • **Reação do Amido com o Ácido Tiodiglicólico**
 [Reaction of Starch with Thiodiglycolic Acid. In Portuguese.
 English summary, p. 45]
 D. M. PEIXOTO, FEIGA R. T. ROSENTHAL, and E. TOLMASQUIM
 National Institute of Technology, Rio de Janeiro, Brazil
 An. Acad. Brasil Cienc. 40(1): 41-45. March 1968
- 236-F** • **Einige Beobachtungen an Stärkefilmen**
 [Some Observations on Starch Films. In German.
 English summary, p. 74]
 M. BLINC and D. STUCIN
 Slovenian Academy of Sciences and Arts, Ljubljana, Yugoslavia
 Staerke 20(3): 69-74. March 1968
- 237-F** • **The Conformation of Amylose in Neutral, Aqueous Salt Solution**
 W. BANKS and C. T. GREENWOOD
 University of Edinburgh, Edinburgh, Scotland
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- 238-F** • **Effect of Processing Conditions on the Nutritive Value of Isolated Soybean Proteins**
 URI COGAN, ANINA YARON, ZEKI BERK, and GIDEON ZIMMERMANN
 Technion-Israel Institute of Technology, Haifa
 J. Agr. Food Chem. 16(2): 196-198. March-April 1968
- 239-F** • **Some Physico-Chemical Properties of Modified Starches**
 M. BLINC, A. CIMERMAN, E. PERTOT, and D. STUCIN
 Slovenian Academy of Sciences and Arts, Ljubljana, Yugoslavia
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- 240-F*** • **Effect on Sugars of Steaming the Soybeans as the First Process for Preparing Miso [In Japanese]**
 SIN'ITIRO KAWAMURA and KENZI KUWAHARA
 Kagawa University, Takamatsu, Japan
 J. Food Sci. Technol. (Tokyo) 14(12): 535-538. December 1967

- 241-F*** ● **Effects on Sugars of Steaming of Defatted Soybean Flakes as the First Process for Preparing Soy Sauce [In Japanese. English abstract, p. 30]**
 SIN¹ITIRO KAWAMURA and MASAHIRO HUKAGAWA
 Kagawa University, Takamatsu, Japan
 J. Food Sci. Technol. (Tokyo) 15(1): 30-33. January 1968
- 242-F*** ● **Changes of Sugars and Decrease in Available Lysine on Autoclaving Defatted Soybean Flakes [In Japanese. English abstract, p. 478]**
 SIN¹ITIRO KAWAMURA, TADASI KASAI, and AKIKO HONDA
 Kagawa University, Takamatsu, Japan
 J. Jap. Soc. Food Nutr. 20(6): 478-481. March 1968
- 243-F** ● **Solubili di Distilleria di Diversa Provenienza Industriale: Caratteristiche Analitiche degli Estratti [Distillers Dried Solubles from Different Industrial Sources: Analytical Characteristics of Extracts]**
 A. DAL POZZO, A. DANSI, E. MENEGHINI, and C. ZANINI
 Scientific Institute of Chemistry and Biochemistry, Milan, Italy
 Chim. Ind. (Milan) 50(7): 773-776. July 1968
- 244-F** ● **Structure of the Cell Walls of *Micrococcus lysodeikticus*. III. Isolation of a New Peptide Dimer, N^{α} -[L-Alanyl- γ -(α -D-glutamyl-glycine)]-L-lysyl-D-alanyl- N^{α} -[L-alanyl- γ -(α -D-glutamyl-glycine)]-L-lysyl-D-alanine**
 JEAN-MARIE GHUYSEN, EVANGHELOS BRICAS, MARVIN LACHE, and MELINA LEYH-BOUILLE
 University of Liege, Belgium
 Biochemistry 7(4): 1450-1460. April 1968
- 245-F** ● **Structure of the Cell Wall of *Staphylococcus aureus*, Strain Copenhagen. IX. Teichoic Acid and Phage Adsorption**
 JACQUES COYETTE and JEAN-MARIE GHUYSEN
 University of Liege, Liege, Belgium
 Biochemistry 7(6): 2385-2389. June 1968
- 246-F** ● **Diffusible Bitter Peptides in Peptic Hydrolyzate of Soybean Protein**
 MASAO FUJIMAKI, MICHIKO YAMASHITA, YUKIO OKAZAWA, and SOICHI ARAI
 The University of Tokyo, Tokyo, Japan
 Agr. Biol. Chem. (Tokyo) 32(6): 794-795. June 1968

- 247-F** ● **Applying Proteolytic Enzymes on Soybean. 1. Proteolytic Enzyme Treatment of Soybean Protein and Its Effect on the Flavor**
MASAO FUJIMAKI, HIROMICHI KATO, SOICHI ARAI, and ESCOLASTICA TAMAKI
The University of Tokyo, Tokyo, Japan
Food Technol. 22(7): 889-893. July 1968
- 248-F** ● **Amylose Triacetate in Nitromethane—The Second Virial Coefficient**
W. BANKS and C. T. GREENWOOD
University of Edinburgh, Edinburgh, Scotland
Eur. Polym. J. 4: 457-464. 1968
- 249-F** ● **The Hydrodynamic Behaviour of Native Amylose in Good Solvents**
W. BANKS and C. T. GREENWOOD
University of Edinburgh, Edinburgh, Scotland
Carbohydr. Res. 7(4): 414-420. August 1968
- 250-F** ● **Protein-Calcium-Phytic Acid Relationships in Soybean. Part I. Effects of Calcium and Phosphorus on Solubility Characteristics of Soybean Meal Protein**
KYOKO SAIO, EMIKO KOYAMA, and TOKUJI WATANABE
Japan Tofu Association, Tokyo, Japan
Agr. Biol. Chem. (Tokyo) 31(10): 1195-1200. October 1967
- 251-F** ● **Protein-Calcium-Phytic Acid Relationships in Soybean. Part II. Effects of Phytic Acid on Combination of Calcium with Soybean Meal Protein**
KYOKO SAIO, EMIKO KOYAMA, and TOKUJI WATANABE
Japan Tofu Association, Tokyo, Japan
Agr. Biol. Chem. (Tokyo) 32(4): 448-452. April 1968
- 252-F** ● **Disc Electrophoresis of Sorghum Seed Proteins in Polyacrylamide Gels**
L. V. S. SASTRY and T. K. VIRUPAKSHA
Indian Institute of Science, Bangalore, India
Anal. Biochem. 19(3): 505-513. June 1967
- 253-F** ● **Studies on the Protein Content and Amino Acid Composition of Some Varieties of Grain Sorghum**
T. K. VIRUPAKSHA and L. V. S. SASTRY
Indian Institute of Science, Bangalore, India
J. Agr. Food Chem. 16(2): 199-203. March-April 1968



PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Process for Detoxifying and Debittering the Seeds of *Crambe abyssinica*

GUS C. MUSTAKAS and LARRY D. KIRK

U.S. Patent 3,391,000. July 2, 1968

Process for detoxifying and debittering *Crambe abyssinica* meal comprising: heating said meal to a myrosinase-inactivating temperature of at least 180° F., then adding powdered sodium carbonate or sodium

hydroxide, heating reactants to about 220° to 230° F. with direct steam, partially drying the product with indirect heat, and then discharging the product.

Ammoniation Process for Detoxifying the Seeds of *Crambe abyssinica* and Rape

GUS C. MUSTAKAS and LARRY D. KIRK

U.S. Patent 3,392,026. July 9, 1968

A process for debittering and detoxifying thioglucoside-containing seeds such as *Crambe abyssinica* and Brassica (rape) comprising: steaming the seed material at 200° to 215° F. to inactivate en-

zymes, contacting the seed material with reactants ammonia gas and aqueous ammonium hydroxide, subjecting the ammoniated seed material to live steam and finally drying under reduced pressure.

Conjugation of Vegetable Oils via Iron Tricarbonyl Complex and Decomposition Thereof by Carbon Monoxide

EDWIN N. FRANKEL

U.S. Patent 3,392,177. July 9, 1968

This invention involves the pressurized carbon monoxide decomposition of iron tricarbonyl complexes of polyunsaturated vegetable oils formed during

the isomerization of such oils with iron pentacarbonyl at 185° C.

Glucan Production by Fermentation of Fleshy Fungi

EDWIN N. DAVIS, ROBERT A. RHODES, and LOWELL L. WALLEN

U.S. Patent 3,396,082. August 6, 1968

Excellent yield of β -1,3-glucan polysaccharides are obtained by fermenting mycelium of certain fungi classified as species of *Helotium* and *Plectania* under aerobic conditions in a tap-water medium initially containing about 4% by weight of an assimilable mono-

or disaccharide and 0.5% by weight of defatted soy flakes, and harvesting the so-produced destructible glucan very soon after the disappearance of the nutrient sugar.

Carbohydrate-Derived Polymers

WILLIAM A. P. BLACK, ERIC T. DEWAR, and DAVID RUTHERFORD

U.S. Patent 3,400,107. September 3, 1968

This invention describes the synthesis of novel monomeric isopropylidene-protected methacrylates containing reactive hexitol residues and the formation

of the corresponding water-soluble polymers that are readily deacetonated to give metal ion sequestering sugar acid-containing polymethacrylates.

Carbohydrate-Derived Polymers

WILLIAM A. P. BLACK, ERIC T. DEWAR, and DAVID RUTHERFORD

U.S. Patent 3,404,136. October 1, 1968

This invention discloses the preparation of a novel isopropylidene-protected vinyl ether derivative of glu-

cose and its polymerization to a high-molecular-weight linear homopolymer.

Process for Preparing Polyether-Polyurethane-Starch Resins

FELIX H. OTEY, FLORENCE L. BENNETT, and CHARLES L. MEHLTRETTER

U.S. Patent 3,405,080. October 8, 1968

Low cost polyether-urethane parts for small machines, chair legs, and the like are obtained by pressure molding an unfoamed diisocyanate modified

glycol glycoside polyether prepolymer of which prepolymer about one-half to about two-thirds of the total weight represents directly added starch.

Color Imparting Complexes of Starch Ethers for Swimming Pools

CHARLES L. MEHLTRETTER and WILLIAM B. ROTH

U.S. Patent 3,414,515. December 3, 1968

Swimming pools can be disinfected with nonirritant iodine instead of chlorine and at the same time be given a stable, highly attractive green to blue coloration that masks the expected yellow tint of the uncomplexed excess iodine by using the deeply blue

iodine complex of a hydroxyalkyl ether of amylose and of amylose-containing starches having a degree of substitution of 0.014 to 0.050 or by forming the said complex in situ.

Graft Polymers of Polyalkylene Oxides on Starch and Dextrin

ALBERT ZILKHA, MENASHE TAHAN, and GABRIEL EZRA

U.S. Patent 3,414,530. December 3, 1968

Graft copolymers of polyalkylene oxides on starch and dextrin polysaccharides having utility as adhesives, emulsifiers, and thickeners are prepared by re-

acting under aprotic conditions the alkali metal alkoxide derivative of the polysaccharide with one or more of the alkylene oxides.

Production of C₁₈ Cyclic Acids in Aqueous Solvent

ROBERT E. BEAL and ROGER A. EISENHAUER

U.S. Patent 3,419,586. December 31, 1968

Commercial yields of linolenic-derived, monomeric C₁₈ conjugated cyclohexadiene monocarboxylic acid isomers are obtained in a completely aqueous reaction

medium by isomerizing the cyclizing linseed oil or methyl linolenate in excess alkali at a temperature of 295° to 300° C.

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New Orleans, Louisiana 70119

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Western Utilization Research
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